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ABSTRACT

This study investigated the relationships between the online searching behavior of novice searchers and three measures of learning style--the Learning Style Inventory (LSI), the Remote Association Test (RAT), and the Symbolic Reasoning Test (SRT). The three tests were administered to 76 graduate students during the first class meeting of a beginning online searching course. Five measures of online behavior were then applied to printouts from two searching assignments completed by the students: (1) cycles; (2) commands; (3) descriptors; (4) connect time; and (5) references. After the end of the course and assignment of grades, scores were recorded from the LSI, RAT, and SRT and from the measures of online behavior taken from printouts of the two assigned searches. Analysis of these data showed some consistent relationships between modes of learning measured by the LSI and online searching behavior. Novice searchers who ranked in the assimilation quadrant tended to spend more time online, enter more commands, complete more cycles, key in more descriptors, and print more references during a search. Those who ranked in the accommodation quadrant tended to spend less time online, enter fewer commands, complete fewer cycles, key in fewer descriptors, and print fewer references. While these measures do not attempt to evaluate the results of a search, the findings of this study have implications for the selection and training of online searchers. (Author/CGD)

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LEARNING MODES AND ONLINE BEHAVIOR OF NOVICE SEARCHERS

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Keywords: Novice Searchers, Learning Styles, Online Searching

Abstract: Online searching behavior has been examined from a number of perspectives in the past decade. Among them have been studies by Woelfl, and Logan and Woelfl examining the relationships between online searching behavior and measures of learning style. The present paper reports findings from seventy-six novice seachers from Florida State University. Results show some consistent relationships between modes of learning measured by The Learning Style Inventory and online searching behavior. Novice searchers who rank in the Assimilation quadrant tend to spend longer online, enter more commands, complete more cycles, key more descriptors, and print more references during a search; those who rank in Accommodation quadrant tend to spend less time online, enter fewer commands, complete fewer cycles, key fewer descriptors, and print fewer references. While these measures do not attempt to evaluate the results of a search, there are implications for the selection and training of online searchers.

1. INTRODUCTION

Several different studies in recent years have observed marked differences in the online searching processes followed by searchers. (1,2,3) There have also been attempts to identify some of the particular characteristics associated with online behavior. (4,5,6,7,8) Woelfl in her study of experineced MEDLINE searchers, (9) and Saracevic et al., (10) in their study of information seeking and retrieving behavior have documented substantial online differences among searchers of similar experience even when searching the same query.

In a paper describing initial findings from a small sample of novice searchers, Logan and Woelfl, (11) reported some correlations between measures of learning style and the online searching behavior of beginning online searching students. The findings corroborate findings from Woelfl's MEDLINE study and suggest a possible relationship between learning style and search behavior regardless of the searcher's experience. The present study reports findings from a more extensive population of novice searchers. (12)

2. BACKGROUND

The three measures of learning style used in the study are: The Learning Style Inventory (LSI), a self-descriptive instrument used to measure preferences for four basic modes of learning, concrete experience, reflective observation, abstract conceptulization, and active experimentation. From the preferences indicated for these basic modes, cour styles of learning can be identified, convergence, divergence, assimilation and accommodation.(13)

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The Remote Associates Test (RAT), a test evaluated as being closely related to verbal reasoning. (14) In Woelfl's MEDLINE study it is used as a measure of verbal inference, or the ability to infer a search strategy from a search query.

The Symbolic Reasoning Test (SRT), a test taken from the Employee Aptitude Survey. (15) It measures the ability to draw correct conclusions from symbolic statements. In Woelfl's study it is used as a measure on non-verbal reasoning or the ability to carry out the essential online task of performing Boolean operations.

The five measures of online behavior include:

Cycles, the number of iterations during a search.

Commands, the number of directives issued in response to the system prompt.

Descriptors, the number of actual terms for which the system is asked to search.

Connect Time, the total amount of time spent online during a search.

References, the number of records types or printed out during a search.

3. METHOD

The three tests of learning style (LSI, RAT, SRT) have been administered during the first class meeting of the beginning online searching course at the Florida State University Graduate School of Library and Information Studies each semester since the fall of 1985. These have been coded so that anonymity of the subjects is preserved throughout the course. The five measures of online behavior are applied to printouts from two searching assignments: a search for bibliographic information on two assigned topics; and a search initiated by the student from a client query.

After the completion of the course, and assignment of grades, scores are recorded form the LSI, RAT and SRT and from the measures of online behavior taken from the printout of the two assigned searches. For this study a data base of scores from all classes was compiled and the MINITAB statistical package used to evaluate the relationships. (16) Students who are not native speakers of the English language as well as some students for whom accurate data was not available were omitted from the study.

4. RESULTS

Scores from the Learning Style Inventory indicate that on the Learnint Style Grid, a large percent (45%) of this dataset falls into the Diverger quadrant and a considerably smaller percent (9%) into the Converger quadrant. As can be seem from Figure 1 the Accommodator and Assimilator quadrants contain roughly the same percents.

These distributions differ from the findings in Woelfl's first study which identifies a large proportion of the subjects as Convergers and from the engineering students in Borgman's study that closely resemble Woelfl's subjects in their distribution. (17)

FIGURE 1

LEARNING STYLES

	ACTIVE EXPERIMENTATION	REFLECTIVE OBSERVATION
CONCRETE EXPERIENCE	Accommodator 17 (22%)	Diverger 34 (45%)
ABSTRACT CONCEPTUAL-IZATION	Converger 7 (9%)	Assimilator 18 (24%)

The following table gives the relative numbers for each of three studies

Table 1

Quadrant Placement From LSI Scores - Three Studies

	LOGAN	BORGMAN			WOELFL
	Total	Total	Eng	Engl	Total
ACC	17	10	2	4	6
ASS	18	18	6	6	11
CON	7	18	10	4	25
DIV	34	16	0	10	1

Mean scores from the Remote Associates Test and the Symbolic Reasoning Test do not differ appreciably from those of the other two studies. Table 2 shows the scores.

Table 2

Comparison of Mean RAT and SRT Scores - Three Studies

	LOGAN		BORGMAN		WOELFL	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
RAT	13.04	4.6	10.3	5.2	14.4	5.7
SRT	9.1	6.8	14.7	6.0	11.7	6.0

Using multiple regression techniques to examine the relationships between scores for the test of learning mode and the measures of online behavior, the results show little correlation among the individual measures.

Correlating composite scores from the LSI with measures of online behavior gives correlations well below ranges of significance, however they do exhibit a degree of consistency that may be worth noting. Looking at the correlations between the AC-CE scores which reflect the placement on the continuum between Abstract Conceptualization and Concrete Experience (higher scores indicate an "abstract" rating) and the measures of online behavior, there is a consistently positive relationship. Conversely, the correlation between AE-RO scores, which indicate placement on the continuum between Active Experimentation and Reflective Observation (higher scores indicate an "active" rating) and the measures of online behavior, there is a consistent negative relationship. Table 3 shows these relationships and the relationships for the RAT and SRT tests.

Table 3

Correlations Between LSI Composite Scores and Online Measures

	AC-CE	AE-RO	RAT	SRT
Cycles	.230	-.170	-.060	.088
Commands	.158	-.116	-.133	.029
Descriptors	.292	-.253	-.084	.061
Connect Time	.327	-.169	-.024	.048
References	.167	-.102	.090	.202

However, looking at the relationships between the five measures of online behavior and placement on the Learning Style Inventory Grid, the findings are considerably more interesting.

As can be seen in Figure 1, subjects ranking themselves as "high" in the areas of Active Experimentation and Concrete Experience are placed in the Accommodator quadrant. Accommodators are characterized as solving problems intuitively through trial and error, and having as their greatest strengths, doing things and generating enthusiasm in others.

High scores in Reflective Observation and Abstract Conceptualization place the subject in the Assimilator quadrant. Assimilators are characterized as using inductive reasoning, creating theoretical models, and assimilating much into integrated explanations.

Placement in the other two sections follows the same pattern. Convergers use deductive reasoning to solve problems, and tend to do well in situations where single correct answers are called for. Divergers view experience from many points of view and operate best in open-ended situations where many alternatives are needed.

The mean scores for each of the four quadrant groups of the LSI on the online measures is shown in Table 4.

Table 4

Mean Scores for Quadrant Groups

	Cycles	Commands	Descriptors	Connect Time	References
ACC	3.32*	23.88*	20.26*	.321*	17.15*
ASS	4.89*	32.59*	30.63*	.467*	33.47*
CON	3.45*	27.21	17.65*	.340	19.18*
DIV	3.74	25.41	23.58	.344	23.19

* Indicates a statistically significant difference from population mean.

Here it can be seen that Assimilators as a group, spend more time online, issue more commands, complete more cycles, key more descriptors, and print more references than any other group.

Accommodators, on the other hand, spend less time online, issue fewer commands, key fewer discriptors, complete fewer cycles, and print fewer references.

Recall that placement in the Assimilator quadrant depends upon high scores in reflective observation and abstract conceptualization and that placement in the Accommodator quadrant depends upon high scores in concrete experience and active experimentation. In fact the two quadrants are in opposite positions on the LSI grid.

Examining the ranges of individual scores for the five searching measures, observe the very great range between individual searchers. This would seem to corroborate results from other studies. Table 5 shows the minimum and maximum values for the five online searching measures.

Table 5

Minimum and Maximum Values for Five Searching Measures

	Cycles	Commands	Descriptors	Connect Time	References
MIN	1	5	4.5	.057	1
MAX	11	98	101	.983	113

All the maximum values are the scores of a single searcher. Four of the five minimum values are the scores of one other searcher. The searcher whose scores are all maximum values has LSI composite scores that place him in the Assimilator quadrant. The searcher whose score are four of the five minimum values has LSI scores that place her in the Accommodator quadrant.

Looking at the mean RAT and SRT scores for the different LSI quadrant groups, the highest mean score for the SRT appears in the Converger group and the highest mean score for the RAT appears in the Assimilator group. Table 6 shows these values.

Table 6

Mean Scores for RAT and SRT by LSI Groups

	Accommodator	Assimilator	Converger	Diverger
RAT	13.61	14.47*	10.3	12.75
SRT	9.77	10.63	11.12*	8.15

* The difference between this value and the population mean is statistically significant.

These results would appear to be consistent with the purpose for including these measures in the study. The Remote Associates Test is included as a measure of inductive reasoning. One of the characteristics of an Assimilator is the use of inductive reasoning. The Symbolic Reasoning Test is included as a measure of deductive reasoning; Convergers are charaterized in part by their use of deductive reasoning.

5. CONCLUSIONS

The subjects of this study do not fall into the same LSI patterns as subjects of previous studies by Borgman and Woelfl. Although the placement of engineers in Borgman's Study does resemble that of the subjects in Woelfl's Study and the placement of English majors is similar to what we observe in this study. The large percentage of subjects in the Diverger category may reflect the large proportion of our students from social science and humanities undergraduate programs.

The lack of any real correlation between any individual test score from the LSI or from the RAT and SRT seems to indicate that patterns of online search behavior, at least in this case, are a result of more complex variables than can be measured by single scores. On the other hand, there are some encouraging results from relationships between quadrant placement as a result of LSI composite scores and measures of online behavior. Subjects placing in two of the opposing quadrants (Assimilator and Accommodator) appear to have demonstrated equally opposing modes of behavior online. Those subjects who placed in the Accommodator quadrant showed mean scores significantly lower than those of the population mean, whereas the subjects placed in the Assimilator quadrant showed mean scores significantly higher than those of the population mean. The subject with the highest scores on measures of online behavior identifies himself as an Assimilator; the subject with four of the five lowest scores on the searching measures identifies herself as an Accommodator.

Whether in the long run any definite conclusions can be drawn from this or related studies remains to be seen. We can say at this point, however, that for this study it appears that these subjects are able to evaluate themselves on the Learning Style Inventory in such a way as to be consistent with their behavior when online. It may be that this will have some real significance in the selection and training of people for online searching.

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